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ABSTRACT

This paper looks at present and future capabilities for diagnosis and prediction in computer-based guidance efforts and reviews the problems and potentials which will accompany the implementation of such capabilities. In addition to necessary procedural refinement in prediction, future developments in computer-based educational and career predictions will probably see the extension of biographical data inputs as well as inputs from various measurement instruments administered inactively by the computer. These will greatly extend the data base on the individual student and consequently increase the capacity for generating more significant predictions. Diagnosis or the detection of patterns of organization of surface behaviors is not being used presently. The computer could monitor such patterns and the counselor could make a clinical-type judgement regarding its meaning in specific cases. Another analysis could be the detection of population trends and characteristics. The problems associated with such computer use include: (1) cost; (2) loss of humaneness; (3) fitting the individual into the population; (4) misuse; and (5) sharing results. (KJ)

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A Man-Machine System for Contemporary Counseling Practice:

Diagnosis and Prediction

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In the rapidly developing computer-based guidance field, extension into further diagnostic and predictive functions seems to be one of the most predictable next steps. The purpose of this paper is to look realistically at present and future capabilities for diagnosis and prediction in computer-based guidance efforts and to view the likely problems and potentials which will accompany the implementation of such capabilities.

While some counseling authorities might argue the undesirability of diagnosis and prediction (10), most authors who discuss counseling and guidance with emphasis on the school counselor recognize the need for some type of diagnostic effort (1, 11). Students who approach the school counselor usually ask questions which are in one way or another veiled searches for predictive information. Johnny asks the counselor, "Do you think I should attend the local college?" What Johnny is probably looking for is feedback involving a prediction of his chances for admission, retention and satisfaction. To deal effectively with the implied predictive effort in such situations, an extensive data base concerning the student's background and the local college in addition to a careful assessment of the relationships between these two data sets is required. The computer, at the present time, seems to offer the only really adequate means of coping with the extensive parameters of this problem.

Prediction

Since several of the points we must consider concerning diagnosis involves the use of predictions of one type or another, let us begin with a look at present and future computer capabilities in prediction. Of the systems with which this writer is familiar, a number generate fairly extensive data bases of information about the student. These are usually quite detailed records of grades, test scores, ratings, biographical information and health records. Of these, only a few use this information for the purpose of making what are, in effect, gross predictions of academic or job success. For example, the Willowbrook Computerized Vocational Information System places the student in one quarter or another of his class according to grade-point-averages or test results. On the basis

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of this rough division, the computer will positively or negatively reinforce the consideration of specific institutions of higher learning or of selected occupations. (4) The IBM Experimental Educational and Career Exploration System has a similar feature. (3) At present, however, prediction from a regression equation or from the kinds of expectancy tables which are used in some well developed but non-computerized guidance programs are not available in computer-based systems. For example, at Texas A&M, Dr. Lannes Hope each year develops separate prediction equations for entering freshman for each college within the university. These equations use test results and high school records. If such equations were properly generated against similar criteria for other schools, the result would allow a computer based system to predict for a given student his likelihood for success at selected institutions with greater refinement than do many of the gross predictions currently in use.

In addition to such procedural refinement in prediction, future developments in computer-based educational and career predictions will probably see the extension of biographical data inputs as well as inputs from various measurement instruments administered interactively by the computer. These will greatly extend the data base on the individual student and consequently increase the capacity for generating more significant predictions. For example, better utilization of accurate measures of socio-economic and ethnic influences would enable the computer to predict from a data base population to which the interactor is realistically similar. (6,9)

Naturally, the more extensive student data records of the future could be used to generate a great number of predictions against any number of criteria introduced into the opposing data base of information concerning potential educational or occupational choices. The mechanics of doing so, while not actually simple, are certainly within present technological capabilities. When we look to the future for possible extensions of this type of effort, cold economic considerations must temper our enthusiasm. Also, considerations of practicality in terms of realistic likelihood of student and counselor use must govern our considerations.

Within these limiting considerations two future developments seem realistically certain. One of these we might term contingency predictions. This would consist of a series of successive predictions continuously drawing from the various data bases in the computer memory, and attempting to give the interacting student continuous feedback concerning the contingent likelihood of successive career decisions. This would be much like actual and proposed vocational gaming approaches but would

base itself on probabilities for the actual individual interacting with the system.

The other future application which does not seem too remote to this writer is the use of various computer-generated graphical presentations of probability statements in the form of graphs and tables. While the machinery for providing graphical analysis is currently extremely expensive, extrapolations from present practice should not be deterred by current costs. Developments in computer hardware moves on apace, and current projections should not be limited by today's machinery or its present price.

Diagnosis

Let us turn now to a consideration of present and future diagnostic capabilities in computer-based guidance systems. Let me begin by renouncing any implication of fostering a medical orientation in counseling. The illness or disease analogy has proven unproductive in psychiatric practice (5,9) and is not likely to enhance counseling. Operationally, diagnosis here refers to the detection of patterns of organization of surface (observable) behaviors where such organizational patterns are generally predictive of socially undesirable future occurences.

In the Willowbrook (CVIS) system the counselor is provided with daily feedback from the computer in order to advise him of students who have estimated their aptitude or rank in class differently from the actual facts. Also, students whose educational plans are discrepant with their achievement and aptitude measures are called to the counselor's attention. This is feedback of specific incidences which we would assume is judged indicative of possible undesirable future developments. Were a pattern of such incidences of erroneous self-perception to be fathomed by computer monitoring, we would be using a diagnostic procedure as we have defined it.

Campbell has suggested several possible diagnostic procedures for computer operations, (2) but as yet there seems to be no use of such capabilities in the baker's dozen of extant computer-based guidance systems. However, several possibilities seem to be realistically achievable in the near future.

Patterns of student behavior to be monitored might include exceptional variations from the norm in the interactor's frequency or type of use of the computer, where exceptionally frequent or bizarre use in conjunction with certain bits of measured or observed personality traits might signal undue anxiety. Irregular or poor attendance patterns, especially where these occur in conjunction with declining grades would suggest a foreboding pattern. Patterns of discrepancy in self-percept such as those mentioned above, especially where these occur in con-

nection with under- or over-achievement would be another potential pattern for diagnosis. While the computer could be of service in monitoring for such portentious patterns, the counselor would need to make a clinical-type judgment regarding its meaning in the specific, individual case.

Although the following suggestions for future development might more accurately be termed analysis rather than diagnosis, they might well be considered in this context. One such analysis would be an ipsative or idiographic one in which the data on a given individual is carefully studied for the patterns, consistencies and unexpected discrepancies which might be apparent. In this type of approach a concept such as Holland's classification system might be employed in order to assess maturation of interests as one aspect of such analysis or diagnosis.

Another pertinent analysis by the computer would be the detection of population trends and characteristics which would be predictive of group difficulties calling for group processes in treatment. At the same time, such population trend analysis would furnish a better information base for the making of predictions regarding individuals in the population.

Let us turn now to consideration of problems and potentials in the area of computer diagnosis and prediction. Problems in this area of development are not difficult to foresee.

Problems

Looming large is the problem of economic feasibility. Will the added cost of providing such diagnoses and predictions be feasible in that the value of the new information is worth the cost of generating it? Such economic feasibility does not seem too difficult to establish. Balancing the added costs of these system capabilities is the promise of more effective guidance procedures, since only the rare counselor at present has access to such results of data processing.

A second problem is that of loss of humaneness or the threat of losing the human touch. To keep from coming through to the student as a tin god, the computer would need to set out the bases of its diagnosis or prediction. Also a disclaimer to the effect that the individual's future is not being predicted, but that, on the contrary, that which is "normal" for a given population is being stated. In this manner, the student would not emerge thinking he had received "the answer."

Also, the question of whether the individual really fits the population which gave rise to the prediction will have to be dealt with. As discussed above, ethnic, socio-economic and similarly significant factors will have to be matched between the student and the prediction-base population, and where this is not done the individual must be advised of the discrepancies.

Perhaps the most threatening problem is the potential for misuse of predictive or diagnostic information by counselors, parents, teachers and students. The most likely avenue for narrowing this probability of misuse is more effective and extensive counselor education and training.

A related problem is that of determining when and how to share the results of these diagnoses and predictions of the future. It would seem that some of them may well have to come through the mediation of the counselor or at his discretion since the very presentation of such information might well have deleterious results in many cases.

Potentials

The potentials augured by the foreseeable diagnostic and predictive developments discussed seem to make the cost and labor of achieving them worthwhile. One prospect is that the base rate problem inherent in using predictions based on national or statewide populations in a given school will be automatically overcome if predictions are made on present or immediately past populations of the specific school.

An on-going potential is the bright prospect of better predictions as the data bases are updated and the accuracy of predictions are themselves made the object of analysis by the computer.

Today, if the folklore is to be believed, hardly any counselor in the land has time to work out predictive expectancy tables or regression equations in his school. If these tables and equations are not worked out obviously they cannot be used.

Potentially also, research will finally be possible into such matters as the types of diagnoses and predictions actually sought or used by students and counselors. Also, once they are easily available through computer, it will be possible to study how such diagnoses and predictions are used by counselors and clients. Finally, the relative effectiveness of counselor "treatments" or of client choices based on diagnosis or prediction can be studied in comparison with similar choices deriving from less intricate procedures.

This has been a look at one aspect of the possible future of computer based guidance. Its purpose was to take a glimpse at what is being done, and at what is possible and worthwhile as computer-based guidance continues to develop. To this writer the problems of that future are challenging, and the outlook provided by the potentials is indeed bright.

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